REMARKS

Claims 12-13, 15-16, 18-19, 21-22, 24-25, 27, 29, 31, 33 and 35 are currently pending in the present application.

Claims 11, 14, 17, 20, 23, 26, 28, 30, 32 and 34 have been canceled, without prejudice. Claim 35 has been amended to depend from claim 12. Claim 35 was originally dependent from claim 11. This was an inadvertent typographical error, as dependency from claim 11 made claim 35 redundant in view of claim 34. Finally, claim 12 has been amended, without prejudice, for clarity to provide proper antecedent basis for the geometric areas of the adjacent surfaces and for the term "ion exchange membrane." Claim 12, as amended, is no narrower than originally presented, and the amendments have not been made in response to any rejection, nor in anticipation of any rejection. Support for the amendments to claim 12 can be found in the Specification, for example, at page 2, lines 14-22, and in the original claims. No new matter is introduced by the amendments made herein. Additionally, no excess claims fees are necessitated by the amendments made herein. Finally, a complete listing of all claims ever presented in accordance with 37 C.F.R. §1.121 (c)(1) is set forth hereinabove. Accordingly, entry and consideration of the amendments made herein are proper and respectfully requested.

Rejection Under 35 U.S.C. §112, 2nd Paragraph:

In the Office Action, the Examiner rejects claims 11, 14, 17, 20, 23, 26, 28, 30, 32 and 34-35 under 35 U.S.C. §112, second paragraph, as being indefinite. Specifically, the Examiner contends that the term "smooth" in claim 11 is vague and indefinite, as the amount of smoothness is unclear. The remainder of the rejected claims depend from claim 11, and are thus rejected along with claim 11.

Although not agreeing with the Examiner that the term "smooth" is in any way indefinite, particularly when read in view of the Specification (*see, e.g.*, page 4, line 20 through page 5, line 7), in an effort to expedite prosecution of the subject matter of the remaining claims, Applicant has canceled claim 11 and those dependent therefrom, without prejudice to the filing of one or more continuing applications directed to the subject matter thereof. Claim 35, which

originally and inadvertently depended from claim 11, has been amended to depend from claim 12. Accordingly, Applicant respectfully submits that the Examiner's rejection of claims 11, 14, 17, 20, 23, 26, 28, 30, 32 and 34-35 under 35 U.S.C. §112, second paragraph, is moot. Withdrawal of the rejection is respectfully requested.

Rejection Under 35 U.S.C. §102(b):

In the Office Action, the Examiner rejects claims 11-13 and 30-31 under 35 U.S.C. §102(b), as being anticipated by European Patent No. 0785294 A of DeNora ("DeNora"). Additionally, the Examiner rejects claims 11-13 and 30-31 under 35 U.S.C. §102(b), as being anticipated by U.S. Patent No. 6,042,702 of Kolouch, *et al.* ("Kolouch"). The Examiner contends that each of the DeNora and Kolouch references describe electrochemical cells which are the same as Applicant's claimed invention and that the references describe "intimate" contact between the ion exchange membrane and the gas diffusion electrode described therein. The Examiner argues that the intimate contact between the membrane and electrode is the same as a contact area greater than 50% of the geometric areas of the surfaces.

Applicants respectfully traverse the Examiner's anticipation rejections and the contentions set forth in support thereof for at least the following reasons.

One embodiment of Applicant's claimed invention is directed to an electrochemical cell for electrolysis of an aqueous solution of hydrogen chloride, comprising:

(a) an anode half-cell comprising an anode;

(b) a cathode half-cell comprising a gas diffusion electrode as the cathode; and

(c) an ion exchange membrane comprising a perfluorosulfonic acid polymer which is positioned between (a) and (b);

wherein the gas diffusion electrode has a surface having a geometric area, and wherein the ion exchange membrane has a surface having a geometric area, the surface of the ion exchange membrane comprising the perfluorosulfonic acid polymer, and wherein the surface of the gas diffusion electrode and the surface of the ion exchange membrane are adjacent to each

other and, at a pressure of 250 g/cm^2 and a temperature of 60°C, the gas diffusion electrode and the ion exchange membrane have a contact area of at least 50% of their geometric area.

The surface of the ion exchange membrane and the surface of the gas diffusion electrode are such that the contact between the geometric area of the two surfaces is at least 50% or more. This is different than prior art electrochemical cells, and more specifically, is not the same as "intimate" contact as allegedly described in the references. Such improved contact between the surfaces, as claimed, can be achieved, for example, as described in the instant Specification at page 5, lines 4-7, by the choice of suitable materials and suitable application techniques described in the Specification. Applicant has surprisingly found that electrochemical cells according to various embodiments of the claimed invention, having the claimed contact area, can achieve significantly better performance as measured through lower operating voltages as compared to prior art electrochemical cells. (*See*, Applicants' Specification, p. 5, lines 20-22). This can also be seen from the Examples, and in particular Table 1 of the Specification at page 15, wherein the prior art, lower contact area of surfaces ***pressed together in a normal fashion*** provides operating voltages significantly higher than those of the electrochemical cells of the present invention.

In contrast to the present invention, DeNora discloses electrochemical cells wherein the gas diffusion cathode is kept in contact with the ion exchange membrane "by pressing the cathode to the membrane under controlled [and unspecified] temperature, pressure, for a suitable time, before positioning inside the cell." (*See*, DeNora, col. 5, lines 25-29). In this regard, Applicants note that the "conditions" referred to by the Examiner, at col. 5, lines 35-37 of DeNora, relate to the operating pressure differential of the cell described therein, NOT the pressure at which the two surfaces are "pressed."

Applicant's claimed invention does not use the described "pressing" prior to construction to achieve improved contact. Rather, Applicants claim an electrochemical cell comprising materials whereby the two claimed surfaces are smooth such that the claimed percentage contact area is achieved ***under the operating conditions of the cell*** rather than

through a preconstruction "pressing" of the elements. In fact, as shown in the Examples of the instant Specification, the pre-construction "pressing" of elements not designed to have smooth surfaces is unable to achieve the claimed contact area. Thus, Applicants respectfully submit that the Examiner's assertion that the "intimate" contact allegedly described in the reference is NOT the same as the claimed at least 50% contact between the two surfaces.

If, it is the Examiner's position that this an inherent disclosure, then it must be recognized that no rationale has been articulated by the Examiner as to why the alleged inherency must necessarily flow from the teachings of the reference, as is legally required to support an inherency rejection. Moreover, any such rationale would be refuted by the showing of the Examples wherein the prior art "pressing" fails to achieve the claimed degree of contact.

Accordingly, Applicants submit that DeNora fails to disclose the claimed percentage contact area of the surfaces, and respectfully submits that the Examiner's anticipation rejection based on DeNora is improper. Reconsideration and withdrawal of the rejection are respectfully requested.

Similarly, with respect to Kolouch, the reference fails to disclose the claimed percentage contact of the surfaces. Merely indicating that the electrode may be constructed by hot pressing of the catalyst material onto a support material does not teach the claimed percentage contact. Again, as shown by Applicants' Examples, smooth surfaces such that the two elements have an improved degree of contact, as claimed, is different from that prior art "pressed" relationship, and provides improved operating voltage characteristics as shown.

Additionally, Applicants' position with respect to inherency applies similarly to the Kolouch reference. Accordingly, the Examiner's anticipation rejection based on Kolouch is improper. Reconsideration and withdrawal of the rejection are respectfully requested.

Finally, in the Office Action, the Examiner rejects claims 14-29 and 32-35 under 35 U.S.C. §103(a), as being unpatentable over Kolouch, in view of U.S. Patent No. 6,059,943 of Murphy, *et al.* ("Murphy"). Specifically, the Examiner contends that Kolouch describes the claimed electrochemical cells, but that the reference fails to disclose that the perfluorosulfonic

acid polymer has a support embedded thereby or between two layers of the perfluorosulfonic acid. In this regard, the Examiner contends that Murphy discloses such a composite membrane. On this basis, the Examiner argues that the claims would be obvious to one of ordinary skill in the art.

As discussed above, Applicant respectfully submits that neither DeNora or Kolouch disclose an electrochemical cell, as claimed, wherein the ion exchange membrane and gas diffusion electrode have surfaces such that at least 50% of their geometric areas are in contact with one another. The "intimate" contact described in DeNora and the "good" contact described in Kolouch are achieved by pressing of the materials prior to construction of the electrochemical cell and do not achieve the claimed at least 50% surface area contact. Thus, Applicant respectfully submits that the cited combination of references fails to teach or suggest each and every element of Applicant's claimed invention.

Moreover, there is no teaching or suggestion in the references, nor a reason articulated by the Examiner, as to why one of ordinary skill in the art would select the materials and application processes described in Applicants' Specification so as to achieve such smooth surfaces wherein the contact area would be 50% or greater. In this regard, Applicants note that it was their discovery that preparation of such high degree of surface contact materials results in a lower operating voltage and thus improved properties of the electrochemical cell. Accordingly, one of ordinary skill in the art would have no reasonable expectation of successfully reducing the operating voltage by based on any teachings of DeNora or Kolouch, as there is no teaching to do so in either of the cited references. Accordingly, Applicant submits that the cited combination of references fails to satisfy any of the criteria necessary to establish a *prima facie* case of obviousness.

Even if one were to assume for the sake of argument that the cited combination of references could somehow be interpreted to suggest the claimed invention and motivate one of ordinary skill in the art to make the combination and modifications necessary to arrive at Applicants' claimed invention, with some reasonable expectation of success, which they can not,

Applicant respectfully submits that the significantly improved operating voltages of the electrochemical cells in accordance with the claimed invention is unexpected and rebuts any *prima facie* case of obviousness that could arguably be established based upon the cited combination of references.

As shown in the Examples of the Specification, at page 15 in Table 1, the cells prepared in accordance with the invention have percentage contact areas of 50% or more, and achieve operating voltages lower than the prior art electrochemical cells (lower by about 100 to 300 mV). The prior art cells have surface are contact percentages of 18.0%, 8.3% and 6.5%. The results are a significant improvement over the prior art.

In conclusion, Applicant submits that all pending claims patentably distinguish over the prior art of record. Reconsideration, withdrawal of all rejections and a Notice of Allowance are respectfully requested.

Respectfully submitted,

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September 30, 2008 By: _____
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